Face Recognition using Morphological Analysis of Images

Saiba Nazah[1] and Md. Monjurul Islam[2]

[1] Chittagong University of Engineering and Technology

Abstract

Face recognition from still and motion image has been an active and emerging research area in the field of image processing, pattern recognition and so on in the recent years . The challenges associated with discriminant face recognition can be attributed to the following factors such as pose, facial expression, occlusion, image orientation, image condition, presence or absence of structural component and many more. In this paper, we have tried to emphasize on the morphological analysis of images based on the behavior of the intensity value. Firstly images with various situations of a person are selected as training images. Based on the min, max and average characteristics of images, the training model has been built. Morphological analysis like binary image processing, erosion and dilation play the important role to identify the facial portion of an image from the whole one. Finally face recognition has been made for input images based on their intensity value measurement. The training images collected from various database such as YALE, ORL, and UMIST and others. The algorithm performed well and showed 80 percent accuracy on face prediction

Index terms— face recognition, intensity value, morphological analysis, binary image.

1 I. Introduction and Background Study

ace recognition research started in the late 1970s and has become one of the most active and exciting research areas in computer vision and pattern recognition since 1990s. Many algorithms have been developed for face recognition in the last years. Among the crucial issues of face recognition technology, the low-dimensional feature represent action with enhanced discriminatory power is of paramount importance in face recognition systems [1].

Many dimension reduction methods are proposed in the past research, such as linear discriminant analysis (LDA) [2], principal component analysis (PCA) [3], and independent component analysis [4], and so on. But for face recognition problem, owing to the nonlinear and complex distribution of face images under a perceivable variation in viewpoint, illumination or facial expression, the linear techniques, such as PCA or LDA, cannot provide reliable and robust solutions to those face recognition problems with complex face variations [1]. In this paper, we have applied a method to propose morphological analysis for face recognition.

2 II. PROPOSED METHODOLOGY

The main objective of our work is to develop a technique that recognizes face using morphological analysis. The step by step procedure has been discussed below:

? Step 1: Choose a set of training image from any directory under various situations to get required image whose information is required for training purposes.

? Step 2: Find the binary images from the original images.

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Step 3: Morphological operations on the training set of images are done to calculate the average intensity value. We also calculate the minimum and maximum value from the set values of the training images.

The information is stored for further processing of the face recognition.

43   ? Step 4: Select an input image which completely or slightly differs from the training images.

44   ? Step 5: Face recognition of the input image is done. Newly calculated average intensity value is compared
45   with database images. The mostly matched image is used to identify the name of the person.

46   The overall procedure of proposed image recognition technique is illustrated in Fig. 1. The component of the
47   algorithms like binary image processing, erosion and dilation are described in the sub section A. 1

3   i. Binary Image Processing

49   A binary image is a digital image that has only two possible values for each pixel. Typically the two colors used
50   for a binary image are black and white though any two colors can be used. The color used for the object(s) in
51   the image is the foreground color while the rest of the image is the background color. In case of binary operation
52   we approach by this procedure:

53   ? Step 1: Take an input as a binary image and convert it into two dimensional images such as 640*480, 480
54   *320 and so on. Then intensity value like 0 and 1 will be found. ? Step 2: Add all these pixels value by this way
55   0+1+1+1+1+0+1+1+?????.and finally found the total pixel value for the face region.

56   ? Step 3: Since we get all input from database thus the size of the all pixel are comparatively same. Now we
57   divide the binary image pixel value with the total pixel value to get a value which ranged from 0 to 1.

4   b) Structuring Element

59   The basic idea in binary morphology is to probe an image with a simple, pre-defined shape, drawing conclusions
60   on how this shape fits or misses the shapes in the image. This simple "probe" is called structuring element, and
61   is itself a binary image (i.e., a subset of the space or grid).

62   Dilation is an operation that "grows" or "thickens" objects in a binary image. The specific manner and extent
63   if this thickening is controlled by a shape referred to as structuring element. This image was produced by two
64   dilation passes using a disk shaped structuring element. Dilation is one of the two basic operators in the area of
65   mathematical morphology, the other being erosion. It is typically applied to binary images, but there are versions
66   that work on grayscale images. The basic effect of the operator on a binary image is to gradually enlarge the
67   boundaries of regions of foreground pixels (i.e. white pixels, typically). Thus areas of foreground pixels grow in
68   size while holes within those regions become smaller.

5   III. EXPERIMENTAL ANALYSIS

70   The experiment has been done on 400 images for training purposes. For the clarity of the algorithm, we included
71   20 images of US Ex-president Obama and Clinton. The algorithm is tested with 40 images and performed
72   significantly well than the existing state of the art. The detection procedure of an image is shown in Figure 4. It
73   has been shown the image of Barak Obama. The average intensity value which is obtained here found very close
74   to the training images intensity value. This makes the assumption that the image is the Ex-president Obama.
75   The comparative analysis of our new improved face recognition method with other face recognition method is
76   given in Table 1.

6   IV. EXPERIMENTAL ANALYSIS

78   In this paper, For our experiment we built the model by using approximately 400 training images which reflected
79   on the accuracy of the algorithms. It should be tested for various methods and then can be select the best one.
80   Here all sets of pictures contains in one database. For further improvement we can experiment with multiple
81   databases. Kernel Optimization criteria can be used for future improvement.
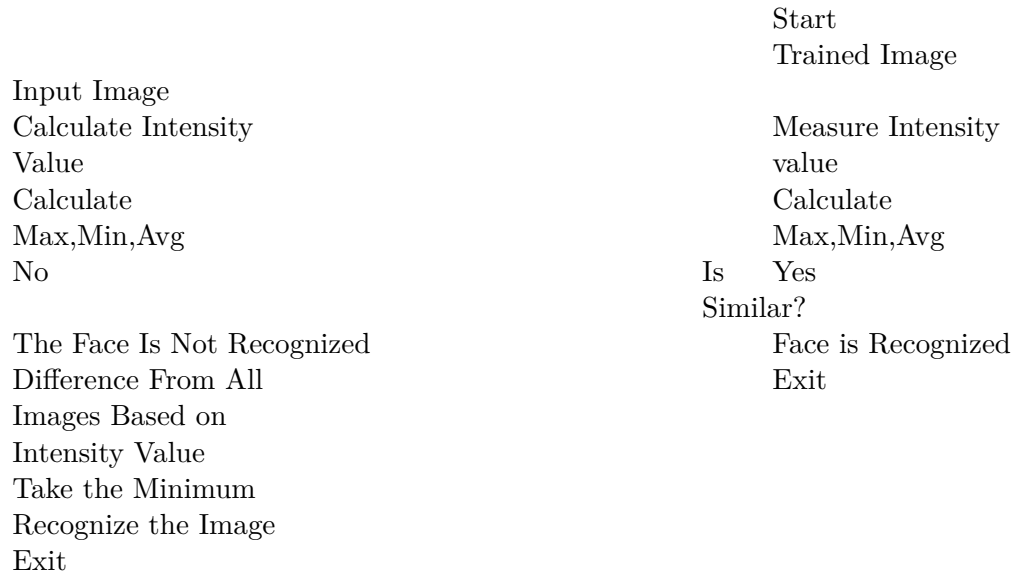
Figure 1: Face

Figure 2: Fig. 1 :

Input Image
Calculate Intensity
Value
Calculate
Max,Min,Avg
No

The Face Is Not Recognized
Difference From All
Images Based on
Intensity Value
Take the Minimum
Recognize the Image
Exit

Start
Trained Image

Measure Intensity
value
Calculate
Max,Min,Avg
Is   Yes
Similar?
Face is Recognized
Exit

Figure 3:

1

Characteristics	Existing models	New Improved model
Required space for processing the trained image	More	Comparatively less
Time Required for processing the trained image	More	Comparatively less
Accuracy	Low	High

Figure 4: Table 1 :

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